



Spectroscopic instruments constantly experience changes in temperature and pressure and undergo mechanical stress and optical decay, resulting in the degradation of their designed performance parameters.

Miniature spectrometers are sturdier than their larger counterparts thanks to their dimensions and lack of moving parts. These small spectrometers also have a higher probability of internal damage caused by extreme mechanical shock directly related to their portability and flexibility of use.

Calibration is required to detect and control this gradual degradation. Such change in performance is defined as “drift.”

To control drift in any measuring device, it needs to be maintained and calibrated to ensure reliable, accurate, and repetitive results. This need is not only emphasized by regulations and norms such as ISO or ASTM, but also for Good Manufacturing Practices and ethical research results’ need for peer-reviewed publications.

Preventive maintenance and calibration practices assure that the measurements and results will be comparable to those obtained by any other person or entity using similar equipment, maintained and calibrated with the same parameters and reference.

Periodic preventive maintenance and calibration are investments that will add value to your research, products, or services. The return on this investment comes not only from reputation and trust but also from more tangible concepts such as better production yields, resource optimization, consistency, and assured compliance with sector-specific regulations.

Preventive maintenance assures that major changes in the instrument are brought back to the original design for proper performance. These changes generally come from consecutive and additive events like power surges or extreme thermal cycling, or from major events such as dropping the instrument.

Calibration is the operation that instructs the instrument to go back to its original settings and specifications. However, calibration can only do so much; if this procedure fails, the instrument needs important adjustments that require the use of specialized tools and personnel.

Spectrometers’ wavelength monitoring and calibration generally require a reference light source. High-purity gas or vapor light sources are the primary standards for testing wavelength accuracy (1–7). Light sources such as a mercury vapor lamp are recommended by testing organizations like ASTM, US Pharmacopoeia, and British Pharmacopoeia.

A recommended practice before performing measure-

Miniature Spectrometers: Preventive Maintenance and Calibration

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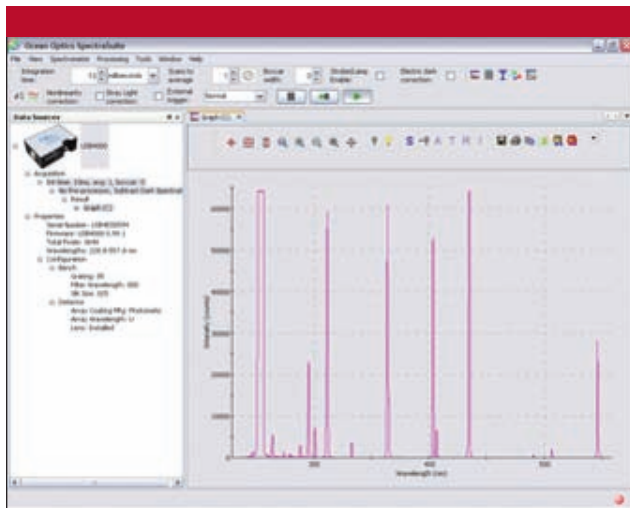


Figure 1: Low-pressure mercury vapor light source typical; spectra.

ments using a spectrometer is to measure the reference lamp. If there is drift between the expected values and the results, the instrument must be calibrated and the calibration confirmed by measuring the reference source again.

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Ocean Optics, Inc.

830 Douglas Ave., Dunedin, FL 34698
Tel. (727) 733-2447, Fax (727) 733-3962
info@oceanoptics.com, www.oceanoptics.com